

CLAIMS

We claim:

1 1. A template for bone milling, comprising:

2 a frame having a top, a bottom, one or more external sidewalls, and one or more
3 internal sidewalls, said frame having one or more openings extending there through from
4 said top to said bottom wherein at least one of said one or more internal side walls defines a
5 peripheral boundary of each of said one or more openings;

6 a guide track formed in said one or more internal sidewalls, said guide track
7 receiving a guide of a bone milling device whereby said bone milling device may be moved
8 about said peripheral boundary using said guide track.

1 2. The template of claim 1 further comprising a means for removably securing said frame
2 to a bone which is to be milled.

1 3. The template of claim 2 wherein said means for removably securing includes one or
2 more tabs projecting from said frame which have one or more securing points which may be
3 secured to a bone.

1 4. The template of claim 3 wherein said one or more tabs project from said one or more
2 external sidewalls.

1 5. The template of claim 1 wherein said guide track is positioned approximately midway
2 between said top and said bottom of said frame.

1 6. The template of claim 1 wherein said guide track has a flat lower surface which is
2 approximately parallel to said top and said bottom of said frame.

1 7. The template of claim 1 wherein said guide track has an angled upper surface which
2 projects at an angle from said lower surface to a point relatively closer to said top of said
3 frame than said bottom of said frame.

1 8. The template of claim 1 wherein said guide track has an arcuate upper surface which
2 extends from said lower surface to a point relatively closer to said top of said frame than
3 said bottom of said frame.

1 9. The template of claim 1 wherein guide track has an arcuate lower surface and an angled
2 upper surface which projects at an angle from said lower surface to a point relatively closer
3 to said top of said frame than said bottom of said frame.

1 10. The template of claim 1 wherein said frame is curved to match one or more curves of a
2 bone.

1 11. The template of claim 10 wherein said frame has a peripheral boundary in a shape
2 configured to accommodate a femoral implant.

1 12. The template of claim 1 wherein said frame has a peripheral boundary in a shape
2 configured to accommodate a tibial implant.

1 13. The template of claim 1 wherein said peripheral boundary has one or more bulbous
2 regions.

1 14. A kit for partial knee replacement surgery; comprising:
2 a plurality of tibial frames, each of said tibial frames having a top, a bottom, an
3 external sidewall, and an internal sidewall, each of said tibial frames having an opening
4 extending therethrough from said top to said bottom of said tibial frame wherein said
5 internal side wall defines a peripheral boundary of said opening, each of said plurality of
6 tibial frames having an opening sized to match one of said plurality of tibial implants;
7 a guide track formed in said internal sidewall of each of said tibial frames, said
8 guide track receiving a guide of a bone milling device whereby said bone milling device
9 may be moved about said peripheral boundary using said guide track.

1 15. The kit of claim 14, further comprising at least one femoral frame having a top, a
2 bottom, an external sidewall, and an internal sidewall, said at least one femoral frame
3 having an opening extending therethrough from said top to said bottom of said femoral
4 frame wherein said internal side wall defines a peripheral boundary of said opening wherein
5 said opening is sized to match said at least one femoral implant.

1 16. The kit of claim 15 wherein said tibial frames are constructed from metal.

1 17. The kit of claim 14 wherein said tibial frames are constructed from plastic.

1 18. The kit of claim 14 wherein said tibial frames are constructed from ceramics.

1 19. The kit of claim 15 wherein said femoral frames is constructed from metal.

1 20. The kit of claim 15 wherein said femoral frame is constructed from plastic.

1 21. The kit of claim 15 wherein said femoral frame is constructed from ceramic.

1 22. The kit of claim 14 further comprising means for removably securing each of said tibial
2 frames to a tibia bone.

1 23. The kit of claim 22 wherein said means for removably securing includes one or more
2 tabs projecting from said tibial frame which have one or more securing points which may
3 be secured to a tibia bone.

1 24. The kit of claim 23 wherein said one or more tabs project from said external side wall
2 of said tibia frame.

1 25. The kit of claim 15 further comprising means for removably securing said at least one
2 femoral frame to a femur bone.

1 26. The kit of claim 14 wherein said guide track in each of said tibial frames is positioned
2 approximately midway between said top and said bottom of said tibial frame.

1 27. The kit of claim 14 wherein said guide track in each of said tibial frames has a flat
2 lower surface which is approximately parallel to said top and said bottom of said tibial
3 frame.

1 28. The kit of claim 14 wherein said guide track in each of said tibial frames has an angled
2 upper surface which projects at an angle from said lower surface to a point relatively closer
3 to said top of said frame than said bottom of said tibial frame.

1 29. The kit of claim 14 wherein said guide track in each of said tibial frames has an arcuate
2 upper surface which extends from said lower surface to a point relatively closer to said top
3 of said tibial frame than said bottom of said tibial frame.

1 30. The kit of claim 14 wherein guide track in each of said tibial frames has an arcuate
2 lower surface and an angled upper surface which projects at an angle from said lower
3 surface to a point relatively closer to said top of said tibial frame than said bottom of said
4 tibial frame.

1 31. The kit of claim 14 wherein said peripheral boundary of at least one of said plurality of
2 tibial frames has one or more bulbous regions

1 32. The kit of claim 15 further comprising a guide track formed in said internal sidewall of
2 said at least one femoral frame, said guide track receiving a guide of a bone milling device
3 whereby said bone milling device may be moved about said peripheral boundary using said
4 guide track.

1 33. The kit of claim 32 wherein said guide track in said at least one femoral frame is
2 positioned approximately midway between said top and said bottom of said femoral frame.

1 34. The kit of claim 32 wherein said guide track in said at least one femoral has a flat lower
2 surface which is approximately parallel to said top and said bottom of said femoral frame.

1 35. The kit of claim 32 wherein said guide track in said at least one femoral frame has an
2 angled upper surface which projects at an angle from said lower surface to a point relatively
3 closer to said top of said femoral frame than said bottom of said femoral frame.

1 36. The kit of claim 32 wherein said guide track in said at least one femoral frame has an
2 arcuate upper surface which extends from said lower surface to a point relatively closer to
3 said top of said femoral frame than said bottom of said femoral frame.

1 37. The kit of claim 32 wherein guide track in said at least one femoral frame has an
2 arcuate lower surface and an angled upper surface which projects at an angle from said
3 lower surface to a point relatively closer to said top of said femoral frame than said bottom
4 of said femoral frame.

1 38. The kit of claim 14 further comprising a bone milling device.

1 39. The kit of claim 38 wherein said bone milling device is a one time use disposable.

1 40. The kit of claim 38 wherein said bone milling device has a milling bit which is angled
2 from a drive member.

1 41. The kit of claim 40 wherein said milling bit is angled at approximately 90 degrees from
2 said drive member.

1 42. The kit of claim 38 wherein said bone milling device includes a peripheral flange
2 which serves as said guide.

1 43. A kit for orthopedic surgery; comprising:
2 a plurality of implants;
3 a plurality of frames, each of said frames having a top, a bottom, an external
4 sidewall, and an internal sidewall, each of said frames having an opening extending
5 therethrough from said top to said bottom of said frame wherein said internal side wall
6 defines a peripheral boundary of said opening, each of said plurality of frames having an
7 opening sized to match one of said plurality of tibial implants; and
8 a guide track formed in said internal sidewall of each of said frames, said guide
9 track receiving a guide of a bone milling device whereby said bone milling device may be
10 moved about said peripheral boundary using said guide track.

1 44. The kit of claim 43 wherein said frames are constructed from metal.

1 45. The kit of claim 43 wherein said frames are constructed from plastic.

1 46. The kit of claim 43 wherein said frames are constructed from ceramics.

1 47. The kit of claim 43 further comprising means for removably securing each of said
2 frames to a bone.

1 48. The kit of claim 47 wherein said means for removably securing includes one or more
2 tabs projecting from said tibial frame which have one or more securing points which may
3 be secured to a bone.

1 49. The kit of claim 48 wherein said one or more tabs project from said external side wall
2 of said frame.

1 50. The kit of claim 43 wherein said guide track in each of said frames is positioned
2 approximately midway between said top and said bottom of said frame.

- 1 51. The kit of claim 43 wherein said guide track in each of said frames has a flat lower
2 surface which is approximately parallel to said top and said bottom of said frame.
- 1 52. The kit of claim 43 wherein said guide track in each of said frames has an angled upper
2 surface which projects at an angle from said lower surface to a point relatively closer to said
3 top of said frame than said bottom of said frame.
- 1 53. The kit of claim 43 wherein said guide track in each of said frames has an arcuate upper
2 surface which extends from said lower surface to a point relatively closer to said top of said
3 frame than said bottom of said frame.
- 1 54. The kit of claim 43 wherein guide track in each of said frames has an arcuate lower
2 surface and an angled upper surface which projects at an angle from said lower surface to a
3 point relatively closer to said top of said frame than said bottom of said frame.
- 1 55. The kit of claim 43 wherein said peripheral boundary of at least one of said plurality of
2 frames has one or more bulbous regions.
- 1 56. The kit of claim 43 further comprising a bone milling device.
- 1 57. The kit of claim 56 wherein said bone milling device is a one time use disposable.
- 1 58. The kit of claim 56 wherein said bone milling device has a milling bit which is angled
2 from a drive member.
- 1 59. The kit of claim 58 wherein said milling bit is angled at approximately 90 degrees from
2 said drive member.
- 1 60. The kit of claim 56 wherein said bone milling device includes a peripheral flange
2 which serves as said guide.

- 1 61. A bone milling method, comprising the steps of:
2 affixing to a joint region of a bone a template having
3 (i) a frame having a top, a bottom, one or more external sidewalls, and one
4 or more internal sidewalls, said frame having one or more openings extending therethrough
5 from said top to said bottom wherein at least one of said one or more internal side walls
6 defines peripheral boundary of each of said one or more openings, and
7 (ii) a guide track formed in said one or more internal sidewalls; and
8 milling a portion of said joint region of said bone using a bone milling device
9 having a guide which is received in said guide track by moving said bone milling device
10 about said peripheral boundary using said guide track to guide said bone milling device.
- 1 62. The method of claim 61 wherein said milling step leaves a central plateau in said joint
2 region which is removed by said bone milling device without using said template.
- 1 63. The method of claim 61 further comprising the step of controlling a depth of milling by
2 said bone milling device.
- 1 64. The method of claim 63 wherein said step of controlling is achieved by selecting a
2 thickness of said frame affixed to said bone in said affixing step.
- 1 65. The method of claim 63 wherein said step of controlling is achieved by selecting a
2 position of said guide track in said frame affixed to said bone in said affixing step.
- 1 66. The method of claim 63 wherein said step of controlling is achieved by selecting a size
2 of a burr used in said milling step.
- 1 67. A template for bone milling, comprising:
2 a frame having a top, a bottom, one or more external sidewalls, and one or more
3 internal sidewalls, said frame having one or more openings extending there through from
4 said top to said bottom wherein at least one of said one or more internal side walls defines a
5 peripheral boundary of each of said one or more openings; and

6 a pre-bent fastening means for removably securing said frame to a posterior surface
7 of a bone which is to be milled.

1 68. The template of claim 67, wherein said pre-bent fastening means is at least one pre-bent
2 tab.

1 69. The template of claim 67, wherein said pre-bent fastening means is at least one pre-bent
2 hook.

1 70. The template of claim 67 further comprising a means for removably securing said
2 frame to an anterior surface of a bone which is to be milled.

1 71. The template of claim 70 wherein said means for removably securing includes one or
2 more tabs projecting from said frame which have one or more securing points which may be
3 secured to a bone.

1 72. The template of claim 71 wherein said one or more tabs project from said one or more
2 external sidewalls.

1 73. The template of claim 67 wherein said frame is curved to match one or more curves of
2 a bone.

1 74. The template of claim 67 wherein said frame has a peripheral boundary in a shape
2 configured to accommodate a femoral implant.

1 75. The template of claim 67 wherein said frame has a peripheral boundary in a shape
2 configured to accommodate a tibial implant.

1 76. The template of claim 67 wherein said peripheral boundary has one or more bulbous
2 regions.

1 77. The template of claim 67 wherein said template further comprises
2 a guide track formed in said one or more internal sidewalls, said guide track
3 receiving a guide of a bone milling device whereby said bone milling device may be moved
4 about said peripheral boundary using said guide track.

1 78. A bone milling method, comprising the steps of:
2 affixing to a joint region of a bone a template having
3 (i) a frame having a top, a bottom, one or more external sidewalls, and one
4 or more internal sidewalls, said frame having one or more openings extending therethrough
5 from said top to said bottom wherein at least one of said one or more internal side walls
6 defines peripheral boundary of each of said one or more openings, and
7 (ii) a pre-bent fastening means for removably securing said frame to a
8 posterior surface of a bone which is to be milled; and
9 milling a portion of said joint region of said bone using a bone milling device.

1 79. The bone milling method of claim 78, wherein said bone milling device has a flange
2 with a flat surface that rests on said top of said frame, said bone milling device moving
3 about said peripheral boundary using said internal sidewall to guide said bone milling
4 device.

1 80. The bone milling method of claim 78, wherein said frame further comprises
2 a guide track formed in said one or more internal sidewalls, said guide track
3 receiving a guide of a bone milling device whereby said bone milling device may be moved
4 about said peripheral boundary using said guide track.

1 81. The method of claim 78, wherein said fastening means is at least one pre-bent tab.

1 82. The method of claim 78, wherein said fastening means is at least one pre-bent hook.

1 83. The method of claim 78 further comprising the step of controlling a depth of milling by
2 said bone milling device.

1 84. The method of claim 83 wherein said step of controlling is achieved by selecting a
2 thickness of said frame affixed to said bone in said affixing step.

1 85. The method of claim 83 wherein said step of controlling is achieved by selecting a size
2 of a burr used in said milling step.

1 86. A bone milling kit, comprising:
2 a plurality of implants; and
3 a plurality of frames, each of said frames having a top, a bottom, an external
4 sidewall, and an internal sidewall, each of said frames having an opening extending
5 therethrough from said top to said bottom of said frame wherein said internal side wall
6 defines a peripheral boundary of said opening, each of said plurality of frames having an
7 opening sized to match one of said plurality of tibial implants, each frame comprising a pre-
8 bent fastening means for removably securing said frame to a non-exposed surface of a bone
9 which is to be milled.

1 87. The kit of claim 86 wherein said frames are constructed from a material selected from
2 the group consisting of metal, plastic, and ceramics.

1 88. The kit of claim 86 further comprising means for removably securing each of said
2 frames to an exposed surface of a bone.

1 89. The kit of claim 88 wherein said means for removably securing includes one or more
2 bendable tabs projecting from said frame which have one or more securing points which
3 may be secured to an exposed surface of a bone.

1 90. The kit of claim 89 wherein said one or more bendable tabs project from said external
2 side wall of said frame.

1 91. The kit of claim 86 wherein said peripheral boundary of at least one of said plurality of
2 frames has one or more bulbous regions.

- 1 92. The kit of claim 86 further comprising a bone milling device.
- 1 93. The kit of claim 92 wherein said bone milling device includes a cutting means with a
2 peripheral flange with a bottom surface which rests on said top of said frame during
3 milling, thereby controlling the depth of cutting of said cutting means.
- 1 94. The kit of claim 92 wherein said bone milling device is a one time use disposable.
- 1 95. The kit of claim 92 wherein said bone milling device has a milling bit which is angled
2 from a drive member.
- 1 96. The kit of claim 95 wherein said milling bit is angled at approximately 90 degrees from
2 said drive member.
- 1 97. The kit of claim 86 wherein said implants are tibial implants and said frames are tibial
2 frames.
- 1 98. The kit of claim 86 wherein said implants are femoral implants and said frames are
2 femoral frames.
- 1 99. A bone milling kit, comprising,
2 at least one frame having a top, a bottom, an external sidewall, and an internal
3 sidewall, said at least one frame having an opening extending therethrough from said top to
4 said bottom of said frame wherein said internal side wall defines a peripheral boundary of
5 said opening; and
6 a milling device with a cutting means and a flange, a bottom surface of said flange
7 riding on said top of said frame and a side surface of said flange abutting against said frame
8 during milling, thereby controlling the depth of cutting by said cutting means.
- 1 100. The kit of claim 99 further comprising one or more means for removably securing said
2 frame to a bone which is to be milled.

1 101. The kit of claim 100 wherein said one or more means for removably securing said
2 frame to a bone is a pre-bent fastening means for removably securing said frame to an un-
3 exposed surface of a bone which is to be milled.

1 102. The kit of claim 100 wherein said one or more means for removably securing includes
2 one or more bendable tabs projecting from said frame which have one or more securing
3 points which may be secured to an exposed surface of a bone.

1 103. The kit of claim 100 wherein said at least one frame is a tibial frame.

1 104. The kit of claim 100 wherein at least one frame is a femoral frame.

1 105. A bone milling device, comprising
2 a drive member;
3 a cutting means; and
4 a radial support means, wherein said radial support means projects along an outer
5 circumference of said cutting means, and wherein said cutting means projects beyond said
6 radial support means by a distance equal to a depth of a cut made by said cutting means.

1 106. The bone milling device of claim 105, wherein said radial support means partially
2 circumscribes said cutting means.

1 107. The bone milling device of claim 105 wherein said radial support means fully
2 circumscribes said cutting means.

1 108. A method of milling a bone, comprising the steps of
2 contacting a surface of said bone with a bone milling device comprising
3 a drive member,
4 a cutting means, and
5 a radial support means, wherein said radial support means projects along an
6 outer circumference of said cutting means, and wherein said cutting means projects

7 beyond said radial support means by a distance equal to a depth of a cut made by
8 said cutting means; and
9 milling a portion of said bone by guiding said bone milling device along said surface
10 of said bone.

1 109. A bone milling kit, comprising
2 a femoral bone milling device, comprising
3 a drive member,
4 a cutting means, and
5 a radial support means, wherein said radial support means projects along an
6 outer circumference of said cutting means, and wherein said cutting means projects
7 beyond said radial support means by a distance equal to a depth of a cut made by
8 said cutting means; and
9 at least one femoral implant.

1 110. The bone milling kit of claim 109, further comprising
2 at least one tibial implant, at least one tibial template, and a milling device for use
3 with said tibial template.

1 111. A bone milling apparatus, comprising
2 i) a cutting device comprising
3 a drive member,
4 a cutting means, and,
5 a chucking mechanism connecting said drive member to said cutting means;
6 and
7 ii) a frame having a top surface and a bottom surface, said frame having a slot
8 extending there through from said top surface to said bottom surface, and at least one
9 support means disposed on said bottom surface;
10 wherein said chucking means extends through said slot, and wherein a bottom
11 surface of said cutting means projects beyond said support means by a distance equal to a
12 depth of a cut made by said cutting means.

1 112. The bone milling apparatus of claim 111, further comprising a latching mechanism to
2 reversibly fix said cutting device at a position along said slot.

1 113. A method of milling a bone, comprising the steps of
2 contacting a surface of said bone with a bone milling apparatus, comprising
3 i) a cutting device comprising
4 a drive member,
5 a cutting means, and,
6 a chucking mechanism connecting said drive member to said cutting means;
7 and
8 ii) a frame having a top surface and a bottom surface, said frame having a slot
9 extending there through from said top surface to said bottom surface, and at least one
10 support means disposed on said bottom surface;
11 wherein said chucking means extends through said slot, and wherein a bottom
12 surface of said cutting means projects beyond said support means by a distance equal to a
13 depth of a cut made by said cutting means; and
14 milling a portion of said bone surface by guiding said bone milling apparatus over
15 said surface of said bone.

1 114. The method of claim 113, wherein said bone milling apparatus further comprises a
2 latching mechanism to reversibly fix said cutting device at a position along said slot.

1 115. A bone milling kit, comprising,
2 a bone milling apparatus, comprising
3 i) a cutting device comprising
4 a drive member,
5 a cutting means, and,
6 a chucking mechanism connecting said drive member to said cutting means;
7 and
8 ii) a frame having a top surface and a bottom surface, said frame having a slot
9 extending there through from said top surface to said bottom surface, and at least one

10 support means disposed on said bottom surface;
11 wherein said chucking means extends through said slot, and wherein a bottom
12 surface of said cutting means projects beyond said support means by a distance equal to a
13 depth of a cut made by said cutting means; and
14 iii) an implant.

1 116. The bone milling kit of claim 115 further comprising at least one tibial implant, at least
2 one tibial template, and a milling device for use with said tibial template.

1 117. The bone milling kit of claim 115, wherein said bone milling apparatus further
2 comprises a latching mechanism to reversibly fix said cutting device at a position along said
3 slot.

1 118. The kit of claim 14 further comprising a plurality of tibial implants and at least one
2 femoral implant.

1 119. The kit of claim 15 wherein said femoral frame is curved to match at least one curve
2 of a femur bone.

1 120. The bone milling kit of claim 99 further comprising at least one implant.

1 121. The bone milling kit of claim 99, wherein said at least one frame is a plurality of
2 frames.